

What is claimed is:

1. A liquid injector for injecting at least a liquid into a subject with injection performing means, comprising:

5 image displaying means for displaying a plotting chart image having a vertical axis and a horizontal axis;

graph entering means for accepting an input action to enter an injection graph having chronologically changing injecting conditions into the displayed plotting chart image;

10 graph storing means for storing data of the entered injection graph;

graph displaying means for displaying an image of the entered injection graph whose data is stored on said displayed plotting chart image; and

15 injection control means for controlling operation of said injection performing means in real-time according to said entered injection graph.

2. A liquid injector according to claim 1, further comprising:

20 time measuring means for measuring a time which has elapsed from at least a start of injection of the liquid;

said image displaying means comprising means for displaying said plotting chart image whose vertical axis represents liquid injection rates and horizontal axis represents liquid injection times;

25 said graph entering means comprising means for accepting an input action to enter said injection graph which represents a liquid injection rate at each liquid injection time into said plotting chart image; and

said injection control means comprising means for controlling operation of said injection performing means in real-time according to the measured time and said entered injection graph.

5 3. A liquid injector according to claim 1, further comprising:

time measuring means for measuring a time which has elapsed from at least a start of injection of the liquid;

said image displaying means comprising means for displaying said plotting chart image whose vertical axis represents quantities to be injected of the liquid and horizontal axis represents liquid injection times;

10 said graph entering means comprising means for accepting an input action to enter said injection graph which represents a quantity of the liquid to be injected at each liquid injection time into said plotting chart image; and

15 said injection control means comprising means for controlling operation of said injection performing means in real-time according to the measured time and said entered injection graph.

20 4. A liquid injector according to claim 1, further comprising:

quantity detecting means for detecting an injected quantity of the liquid from at least a start of injection of the liquid;

said image displaying means comprising means for displaying said plotting chart image whose vertical axis represents liquid injection rates and horizontal axis represents quantities to be injected of the liquid;

25 said graph entering means comprising means for accepting an input action to enter said injection graph which represents a liquid injection

rate at each quantity of the liquid to be injected into said plotting chart image;
and

said injection control means comprising means for controlling
operation of said injection performing means in real-time according to the de-
5 tected injected quantity and said entered injection graph.

5. A liquid injector according to claim 2, further comprising:
quantity calculating means for calculating an injected quantity
of the liquid as the area of a chart portion surrounded by said injection graph
10 and said horizontal axis; and
quantity displaying means for displaying data of the calculated
injected quantity of the liquid.

6. A liquid injector according to claim 1, wherein said graph enter-
15 ing means comprises means for entering a free curve as said injection
graph;
said graph displaying means comprising means for displaying
said injection graph as said free curve.

20 7. A liquid injector according to claim 1, wherein said graph enter-
ing means comprises means for entering a plurality of successive straight
lines as said injection graph;
said graph displaying means comprising means for displaying
said injection graph as said of successive straight lines.

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8. A liquid injector according to claim 1, wherein said graph entering means comprises means for entering a plurality of successive straight lines as said injection graph, said liquid injector further comprising:

graph converting means for converting data of the successive
5 straight lines as said injection graph into data of a free curve;

said graph storing means comprising means for storing data of said injection graph as converted into said free curve;

said graph displaying means comprising means for displaying said injection graph as said free curve; and

10 said injection control means comprising means for controlling operation of said injection performing means according to said injection graph as said free curve.

9. A liquid injector according to claim 1, wherein said graph entering
15 means comprises means for entering a plurality of passing points as said injection graph, said liquid injector further comprising:

graph converting means for generating data of a plurality of successive straight lines produced by successively joining said passing points, as said injection graph;

20 said graph storing means comprising means for storing the generated data of said injection graph;

said graph displaying means comprising means for displaying said injection graph as said successive straight lines; and

25 said injection control means comprising means for controlling operation of said injection performing means according to said injection graph as said successive straight lines.

10. A liquid injector according to claim 1, wherein said graph entering means comprises means for entering a plurality of passing points as said injection graph, said liquid injector further comprising:

5 graph converting means for generating data of a free curve successively passing through said passing points, as said injection graph;

said graph storing means comprising means for storing the generated data of said injection graph;

10 said graph displaying means comprising means for displaying said injection graph as said free curve; and

said injection control means comprising means for controlling operation of said injection performing means according to said injection graph as said free curve.

15 11. A liquid injector according to claim 1, wherein said graph entering means comprises means for entering a plurality of rectangular regions as said injection graph, and said graph displaying means comprises means for displaying said injection graph as said rectangular regions.

20 12. A liquid injector according to claim 5, wherein said graph entering means comprises means for entering a plurality of rectangular regions as said injection graph;

said graph displaying means comprising means for displaying said injection graph as said rectangular regions on said plotting chart image;

said quantity calculating means comprising means for calculating the injected quantity of the liquid as the area of each of said rectangular regions; and

said quantity displaying means comprising means for displaying the calculated injected quantity for each of said rectangular regions.

13. A liquid injector according to claim 10, wherein said graph entering means comprises means for entering input actions to vertically move an upper side of each of said rectangular regions and to horizontally move a right side of each of said rectangular regions.

14. A liquid injector according to claim 1, wherein said graph entering means comprises means for entering a period for interrupting the injection of the liquid into the displayed injection graph, and said injection control means comprising means for temporarily inactivating said injection performing means.

15. A liquid injector according to claim 14, further comprising:
situation displaying means for displaying a remaining time of said period for interrupting the injection of the liquid, together with said injection graph, in real-time on said graph displaying means.

16. A liquid injector according to claim 1, further comprising:
situation displaying means for displaying an injecting situation of said injection performing means, together with said injection graph, in real-time on said graph displaying means.

17. A liquid injector according to claim 1, further comprising:
a touch panel for displaying data and accepting input actions;
said image displaying means comprising means for displaying
5 said plotting chart image on said touch panel;
said graph entering means comprising means for accepting an
input action to enter said injection graph on said touch panel;
said graph displaying means comprising means for displaying
said injection graph on said touch panel.
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18. A liquid injector according to claim 17, further comprising:
an injection head for removably holding a liquid syringe which
comprises a cylinder filled with at least said liquid and a piston slidably in-
serted in said cylinder;
15 said injection performing means comprising means for moving
said cylinder and said piston relatively to each other while said liquid syringe
is being held by said injection head; and
said touch panel being connected to said injection head paral-
lel thereto.
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19. A liquid injector according to claim 1, further comprising:
image storage means for storing data of schematic images of a
plurality of body sections of the human body and schematic images of a plu-
rality of regions to be imaged of the human body in association with each
25 other;

section display means for displaying the schematic images of the body sections in the shape of a human body;

section input means for accepting an input action to select one of the displayed schematic images of the body sections;

5 region displaying means for displaying the schematic image of at least one of said regions to be imaged in relation to the selected schematic image of the body section; and

region input means for accepting an input action to select the displayed schematic image of at least one of said regions to be imaged;

10 said injection performing means comprising means for injecting at least a contrast medium as said liquid into said subject whose fluoroscopic image is to be captured by an imaging diagnostic apparatus;

said graph entering means comprising means for entering said injection graph for each of said regions to be imaged of the human body;

15 said graph storing means comprising means for storing data of said injection graph for each of said regions to be imaged; and

said injection control means comprising means for controlling operation of said injection performing means according to the injection graph for the selected region to be imaged.

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20. A liquid injector according to claim 1, wherein said injection performing means comprises a medium injection mechanism for injecting a contrast medium as said liquid and a solution injection mechanism for injecting a saline solution as said liquid;

said graph entering means comprising means for entering injection graphs for said contrast medium and said saline solution which share liquid injection times; and

said injection control means comprising means for controlling
5 operation of said medium injection mechanism and said solution injection mechanism in an interlinked fashion according to said injection graphs for said contrast medium and said saline solution.

21. A method of injecting at least a liquid into a subject with injection performing means, comprising the steps of:

10 displaying a plotting chart image having a vertical axis and a horizontal axis;

accepting an input action to enter an injection graph having chronologically changing injecting conditions into the displayed plotting chart
15 image;

storing data of the entered injection graph;

displaying an image of the entered injection graph whose data is stored on said displayed plotting chart image; and

controlling operation of said injection performing means in real-
20 time according to said entered injection graph.

22. A method according to claim 21, further comprising the steps of:

displaying said plotting chart image whose vertical axis represents liquid injection rates and horizontal axis represents liquid injection
25 times;

accepting an input action to enter said injection graph which represents a liquid injection rate at each liquid injection time into said plotting chart image;

measuring a time which has elapsed from at least a start of injection of the liquid; and

controlling operation of said injection performing means in real-time according to the measured time and said entered injection graph.

23. A method according to claim 21, further comprising the steps of:

displaying said plotting chart image whose vertical axis represents quantities to be injected of the liquid and horizontal axis represents liquid injection times;

accepting an input action to enter said injection graph which represents a quantity of the liquid to be injected at each liquid injection time into said plotting chart image;

measuring a time which has elapsed from at least a start of injection of the liquid; and

controlling operation of said injection performing means in real-time according to the measured time and said entered injection graph.

24. A method according to claim 21, further comprising the steps of:

displaying said plotting chart image whose vertical axis represents liquid injection rates and horizontal axis represents quantities to be injected of the liquid;

accepting an input action to enter said injection graph which represents a liquid injection rate at each quantity of the liquid to be injected into said plotting chart image;

5 detecting an injected quantity of the liquid from at least a start of injection of the liquid; and

controlling operation of said injection performing means in real-time according to the detected injected quantity and said entered injection graph.

10 25. A computer program for controlling a liquid injector for injecting a liquid into a subject with injection performing means so as to enable said injection performing means to carry out a process which comprises the steps of:

15 displaying a plotting chart image having a vertical axis and a horizontal axis;

accepting an input action to enter an injection graph having chronologically changing injecting conditions into the displayed plotting chart image;

storing data of the entered injection graph;

20 displaying an image of the entered injection graph whose data is stored on said displayed plotting chart image; and

controlling operation of said injection performing means in real-time according to said entered injection graph.

26. A computer program according to claim 25, for enabling said injection performing means to carry out the process which further comprises the steps of:

5 displaying said plotting chart image whose vertical axis represents liquid injection rates and horizontal axis represents liquid injection times;

accepting an input action to enter said injection graph which represents a liquid injection rate at each liquid injection time into said plotting chart image;

10 measuring a time which has elapsed from at least a start of injection of the liquid; and

controlling operation of said injection performing means in real-time according to the measured time and said entered injection graph.

15 27. A computer program according to claim 25, for enabling said injection performing means to carry out the process which further comprises the steps of:

20 displaying said plotting chart image whose vertical axis represents quantities to be injected of the liquid and horizontal axis represents liquid injection times;

accepting an input action to enter said injection graph which represents a quantity of the liquid to be injected at each liquid injection time into said plotting chart image;

25 measuring a time which has elapsed from at least a start of injection of the liquid; and

controlling operation of said injection performing means in real-time according to the measured time and said entered injection graph.

28. A computer program according to claim 25, for enabling said
5 injection performing means to carry out the process which further comprises the steps of:

displaying said plotting chart image whose vertical axis represents liquid injection rates and horizontal axis represents quantities to be injected of the liquid;

10 accepting an input action to enter said injection graph which represents a liquid injection rate at each quantity of the liquid to be injected into said plotting chart image;

detecting an injected quantity of the liquid from at least a start of injection of the liquid; and

15 controlling operation of said injection performing means in real-time according to the detected injected quantity and said entered injection graph.

29. An information storage medium storing data of a computer
20 program according to claim 25 for controlling a liquid injector for injecting a liquid into a subject with injection performing means.